

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
16 June 2005 (16.06.2005)

PCT

(10) International Publication Number
WO 2005/054640 A1

(51) International Patent Classification⁷: F01P 7/16, 5/12

(21) International Application Number:
PCT/GB2004/005020

(22) International Filing Date:
30 November 2004 (30.11.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0327966.8 3 December 2003 (03.12.2003) GB

(71) Applicant (for all designated States except US, UZ): ECH-
LIN DO BRASIL INDUSTRIA E COMERCIO LTDA
[BR/BR]; Fukuichi Nakata Avenue 381, Diadema, CEP-
09950-400 São Paulo (BR).

(71) Applicant (for UZ only): DANA AUTOMOTIVE LIM-
ITED [GB/GB]; 2 Central Park Drive, Rugby, Warwick-
shire CV23 0WE (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): FILHO, Ayres
[BR/BR]; Fukuichi Nakata Avenue 381, Diadema,

CEP-09950-400 São Paulo (BR). RIBEIRO, Eduardo
[BR/BR]; Fukuichi Nakata Avenue 381, Diadema,
CEP-09950-400 São Paulo (BR). FERRAZ, Edgard
[BR/BR]; Fukuichi Nakata Avenue 381, Diadema,
CEP-09950-400 São Paulo (BR). GASTALDO, Fer-
nando [BR/BR]; Fukuichi Nakata Avenue 381, Diadema,
CEP-09950-400 São Paulo (BR).

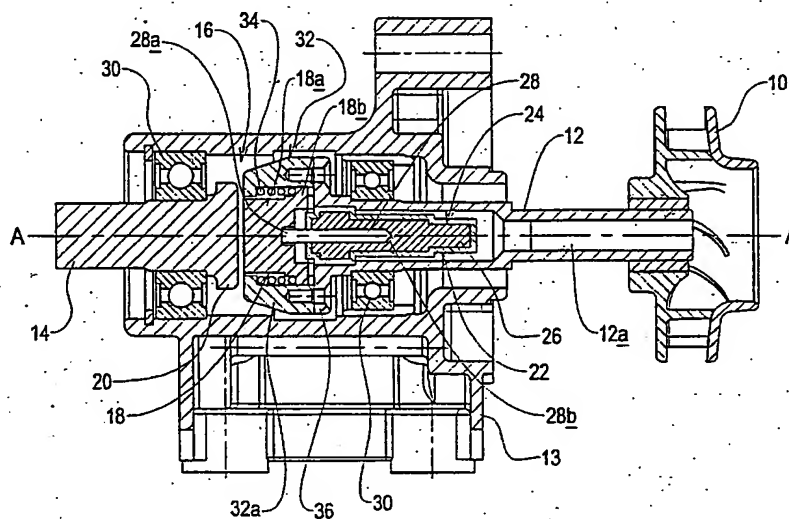
(74) Agent: FORRESTER KETLEY & CO; Chamberlain
House, Paradise Place, Birmingham B3 3HP (GB).

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,

[Continued on next page]

(54) Title: COOLING SYSTEM



(57) Abstract: A cooling system for an internal combustion engine including a pump with an impeller (10) for pumping liquid coolant around a cooling circuit, and a drive shaft (14), wherein between the impeller (10) and drive shaft (14) there is provided a clutch (16) including first (18) and second (20) clutch members which are moveable into and out of engagement, to connect and disconnect drive from the drive shaft (14) to the impeller (10) respectively, by a temperature sensitive device (22) which includes a chamber (24) in which there is provided a material (26) which over a first, lower, temperature range is in a first state, and over a second, higher, temperature range is in a second state, the material (26) changing in volume when transforming from the first to the second state to urge the first (18) and second (20) clutch members together to transmit drive, and wherein the impeller (10) has an internal hollow (12a) into which coolant to be pumped may pass, so that the coolant is in thermal communication with the material (26) in the chamber (24).

WO 2005/054640 A1



GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.